

An investigation of this table will show that this winter thunder-storm presented, as regards the electrical conditions, the same general features as the storms of the previous summer. Among many other points, we may notice briefly the rapidly fluctuating character of the curve; the disturbances in the potential, due to the inductive action of the clouds, the values increasing with the cloud's approach and decreasing with its passage; the character of these fluctuations, compared with those due to other causes, being marked by a steadiness of movement in one or the other direction; the rapid changes in value, immediately after, or simultaneous with, flashes of lightning; and, finally, the fluctuations due to rain drops. With regard to the lightning, it would seem that certain discharges occur, which, while not seen, are indicated by the electrometer. For a short time immediately preceding a flash of lightning there occurs a quick, steady rise in the potential, until the electrical tension becomes so great that a disruptive discharge occurs. (It might, incidentally, be remarked that, according to Thomson, air at ordinary pressure and temperature can support an electric tension of 9,600 grains weight per square foot before a spark passes.) With the passage of the spark the electric tension ceases and equilibrium is restored. With every flash of lightning the potential immediately falls to zero, to begin slowly to increase, then more rapidly, until the disruptive discharge again occurs. From all this it must be seen that in the electrometer we have but the first application of certain principles in electricity, which can be made of practical service in warning us of the probability of lightning strokes, as well as the advent of the storm.

Other negative values occurred at New Haven on the 22d, with the change of snow into rain, while heavy snow was accompanied with positive values on the 2d, 22d, and 26th.

At Boston, Massachusetts, during the month of February, 1887, negative values occurred on the 6th, at 9 a. m., preceding light rain; on the 10th, preceding threatening weather; on the 11th, preceding rain; on the 18th, at 2.15 p. m., during heavy snow; on the 19th, at 9 a. m., preceding clearing weather, and on the 26th, preceding snow. Snow with positive values occurred on the 1st, 2d, 3d, 18th, 23d, 25th, and 27th. The highest positive potentials occur during clear, cold weather.

At Ithaca, New York, during heavy snow at 9 a. m. of the 1st, high positive values were obtained; on the 2d, during snow throughout the day, the values at the different observations were 1,300, -150, -600, -420 volts. On the 3d rain began at 9.00 a. m., and ended at 2.30 p. m., accompanied by negative values, changing to positive after the ending of the rain; on the 4th low positive during light snow, turning to negative. Snow began on the 7th at 10 a. m., turning to rain at 11.30 a. m., with the following values, -177, -1,215, -308, -205. Negative values occur also on the 8th, during cloudy weather; on the 9th, during fair weather; on the 11th, during fog and rain; on the 12th, preceding and during, snow; on the 13th and 14th, during fine weather; on the 15th, during cloudy weather; on the 17th, during cloudy and clear weather, but preceding snow; on the 19th, preceding, and during, snow; on the 20th, during cloudy weather; on the 21st, during threatening weather, and preceding snow; on the 22d, following snow; and on the 25th, during clear weather, but preceding snow.

ELECTRICAL PHENOMENA.

Fort Maginnis, Montana: cloudy and comparatively warm weather, with light to fresh westerly winds prevailed during the 13th until 2 p. m., when the wind suddenly shifted to northwest and blew a gale of increasing violence until 8.10 p. m., reaching a velocity of eighty-four miles per hour. During the storm the atmosphere was thoroughly charged with electricity, as indicated by the imperfect working of the telegraph instruments.

Dodge City, Kansas: on the 17th high southwest and northwest winds prevailed, blowing down several chimneys and small houses. Light rain fell from 2.10 to 2.25 p. m. The ob-

server at this station states that while the gale was at its height the air was highly charged with electricity, so much so that the battery at Dodge City being disconnected and the wire grounded at Ashland, a town about fifty miles distant, messages were sent between the two points. The observer also at Fort Supply, Indian Territory, states that on the 17th the telegraph instruments worked very badly on account of atmospheric electricity, and during the afternoon he was unable to raise any station except Fort Elliott, Texas. Heavy westerly wind and cloudy weather prevailed.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed at stations in Montana, Dakota, and the Missouri Valley on the 2d. On the 3d and 4th they were reported from a number of stations in the central valleys, the Lake region, and New England. The storm that prevailed over the northeastern quarter of the country on the 11th was preceded on the 9th in the Missouri and upper Mississippi valleys and on the 10th in New England and the Lake region, by solar halos, and was accompanied on the 11th by halos in the Lake region and upper Mississippi valley. From the 12th to the 18th a few halos were reported from widely separated stations. The low area which prevailed over the Lake region and upper Mississippi valley on the morning of the 18th was accompanied and succeeded by solar halos; they were reported from a number of stations in the upper Mississippi valley on the 18th, and from stations in the Gulf States, Mississippi Valley, and Lake region on the 19th. Solar halos were observed at numerous places in New England and the Lake region on the 20th and 23d. The storm that prevailed on the 25th and 26th was preceded on the morning of the 25th by solar halos which were reported from a large number of stations in New England, the Lake region, and upper Mississippi valley.

LUNAR HALOS.

Lunar halos were noted at numerous stations from the 2d to 9th. On the 3d they were observed in the Lake region and at nearly every station in the Missouri and upper Mississippi valleys; in these districts very high pressure and low temperatures prevailed at the time; they were also reported on that date from a few stations in the Ohio Valley, Tennessee, California, and from numerous stations in Arizona. On the 4th a large number of stations in New England, the middle Atlantic states, Ohio Valley, and Lake region reported lunar halos; these were also accompanied or followed by very high pressure and low temperature. On the 28th they were reported from a number of stations in the upper Mississippi valley, the Lake region, and the middle Atlantic states.

The phases of the moon (Washington mean time) during February, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: New moon, 22d, 4 h. 32.1 m.; full moon, 7th, 17h. 5.9 m.; last quarter, 14th, 8h. 23.8 m.; perigee, 8th, 19.3 h.; apogee, 24th, 0.9 h.

MIRAGE.

Saint Vincent, Minnesota: during the morning of the 9th a mirage was seen over the prairie to the south of this place. A track of land, ten miles distant and beyond the line of vision, appeared to be raised in the air, sloping toward the north at an angle of about 45°. All objects, such as houses, barns, and trees, were plainly visible.

Webster, Dakota: mirages were seen on the mornings of the 14th, 16th, and 27th; on the 14th the phenomenon occurred before sunrise, apparently bringing the image of distant objects very near.

Willcox, Arizona: the phenomenon of mirage was seen nearly every day of the month.

Mirages were also seen at Parkston, Dakota, on the 5th and 27th; Henry, Dakota, on the 27th, and Marquette, Nebraska, 28th.